CLAIMS

1. An ink jet printing device comprising:

a head unit in which a plurality of recording heads having discharge nozzles which discharge ink drops of different colors respectively are arranged in a main scanning direction, and the discharge nozzles of each of the recording heads are arranged at equal intervals in a sub-scanning direction which is perpendicular to the main scanning direction;

a head-unit moving unit moving the head unit in the main scanning direction along a printing region of a recording medium;

a recording-medium moving unit moving the recording medium in the sub-scanning direction; and

a control unit controlling the head unit, the head-unit moving unit, and the recording-medium moving unit,

wherein the control unit is configured to carry out printing procedures including steps of moving the recording medium to the printing region to perform the discharging of the ink drops, and moving the recording medium in the sub-scanning direction by an interval represented by the formula H/k where H is an array interval of the discharge nozzles in the sub-scanning direction and k is an integer above one, to perform the discharging of the ink drops to a non-printed

region equivalent to the array interval H of the discharge nozzles, and configured to repeat the printing procedures k times according to an ink dot density, and thereafter move the recording medium in the sub-scanning direction so that the head unit is located to a next non-printed region following the printing region and the printing procedures are performed for the next non-printed region,

wherein the control unit is configured so that a rear-end portion of the discharge nozzles in an array direction after printing of the printing region and a front-end portion of the discharge nozzles in the array direction before printing of the non-printed region overlap each other with respect to the sub-scanning direction, and invalid nozzles that do not discharge the ink drops are determined from among arbitrary ones of the overlapping discharge nozzles including the front-end portion and the rear-end portion in the array direction of the discharge nozzles.

2. The ink jet printing device according to claim 1 wherein the control unit is configured to determine as being the invalid nozzles at least one of the discharge nozzles located in the rear-end portion in the array direction upon a final movement of the head unit in the main scanning direction for printing in the same printing region and one of the discharge nozzles located in the front-end portion in the

array direction upon a first movement of the head unit in the main scanning direction for printing in the non-printed region.

3. The ink jet printing device according to claim 2 wherein, when the number k of repetitions of the movement of the recording medium by the interval H/k in the sub-scanning direction is increased, the control unit is configured to determine as being the invalid nozzles at least one of the discharge nozzles located in the front-end portion in the array direction upon each of movements of the head unit, except for a final movement, in the main scanning direction for printing in the non-printed region.

4. The ink jet printing device according to claim 1 wherein, when the number of the overlapping discharge nozzles is increased, the control unit is configured to increase the number of the invalid nozzles.

5. An image forming apparatus in which an ink jet printing device is provided, the ink jet printing device comprising:

a head unit in which a plurality of recording heads having discharge nozzles which discharge ink drops of different colors respectively are arranged in a main scanning direction, and the discharge nozzles of each of the recording

heads are arranged at equal intervals in a sub-scanning direction which is perpendicular to the main scanning direction;

a head-unit moving unit moving the head unit in the main scanning direction along a printing region of a recording medium;

a recording-medium moving unit moving the recording medium in the sub-scanning direction; and

a control unit controlling the head unit, the head-unit moving unit, and the recording-medium moving unit,

wherein the control unit is configured to carry out printing procedures including steps of moving the recording medium to the printing region to perform the discharging of the ink drops, and moving the recording medium in the sub-scanning direction by an interval represented by the formula H/k where H is an array interval of the discharge nozzles in the sub-scanning direction and k is an integer above one, to perform the discharging of the ink drops to a non-printed region equivalent to the array interval H of the discharge nozzles, and configured to repeat the printing procedures k times according to an ink dot density, and thereafter move the recording medium in the sub-scanning direction so that the head unit is located to a next non-printed region following the printing region and the printing procedures are performed for the next non-printed region,

wherein the control unit is configured so that a rear-end portion of the discharge nozzles in an array direction after printing of the printing region and a front-end portion of the discharge nozzles in the array direction before printing of the non-printed region overlap each other with respect to the sub-scanning direction, and invalid nozzles that do not discharge the ink drops are determined from among arbitrary ones of the overlapping discharge nozzles including the front-end portion and the rear-end portion in the array direction of the discharge nozzles.